# Equitable Pre-College Engineering Education: Teaching with Racism in Mind

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## Abstract

Engineering educators must consider how the cultural backgrounds of students coincide (or diverge) with the epistemological and ontological formation of an engineer. Hence, this work is presented as an exhortation to engineering educators, particularly in a pre-college context, to critically evaluate how race-conscious pedagogies can be exerted in this field. In this autoethnographic study, I convey my attempt to teach engineering with explicit consideration of the sociopolitical context of the Black male youth I taught. As a Black male, I have an insider perspective into the realities that must be navigated to succeed in a racialized society, where Black males are a demographic that has been mercilessly underserved and over-criminalized in the educational system. I discovered three themes that describe my approach to actualizing culturally relevant pedagogy in pre-college engineering education, which are (i) exhibiting political clarity in curriculum design and implementation, (ii) using students' lived experiences as authentic contexts for teaching engineering, and (iii) building relationships with students, their families, and community so that we know the students we are teaching.

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*Keywords:* equity, racism, pre-college engineering, critical autoethnography, culturally relevant pedagogy

## Introduction

In this autoethnographic study, I report on three pedagogical principles that emerged from my attempt to teach engineering with explicit consideration of the sociopolitical context of the Black male youth that I taught. My aspiration for this narrative is to serve as an educative declaration that K-12 engineering educators must do more than simply acknowledge the cultural differences present in their classroom to practice equity; they must ensure the inclusion of the cultural viewpoint of their students in curriculum materials, consider societal prejudices experienced by their students outside of school, and even examine how their own cultural biases influence their teaching (Woodson & Harris, 2018). As a Black male, I have an insider perspective into the realities that must be navigated to succeed in a racialized society; Black males are a demographic that has been mercilessly underserved and over-criminalized in the educational system (Ferguson, 2020; Harper & Wood, 2015; Howard, 2014; Howard et al., 2012; Lackey & Lowery, 2020; Lindsay, 2013). As an engineering student and educator, I have some understanding of the desired characteristics of future engineers expressed by students within the engineering community (e.g., professional societies, academic institutions, etc.) as well as contemporary reforms concerning the aims and processes of the educational experience of the engineer. This shaped the content of the course I facilitated and the aspirational outcomes as it related to exposure and development of engineering concepts. This inquiry revealed that race-conscious, culturally relevant pedagogy enables the sociopolitical teaching of engineering. Engineering educators must consider how the cultural backgrounds of students coincide (or diverge) with the

epistemological and ontological formation of an engineer. Previous studies show that teaching engineering to Black male youth is a fraught endeavor that often leads to perpetuating dehumanization (Bristol, 2015; Holly Jr., 2020; Wright, 2011), so there is a need for scholarship to refine theory about, approaches to, and resources for this work.

*Broadening Participation in Engineering*

For decades, reports calling for actions to increase the number of Black people in science and engineering careers have been produced; withal, this remains a problem the engineering community has yet to significantly disburden (Committee on Equal Opportunities in Science and Engineering, 2015; London et al., 2020; National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2011; National Center for Science and Engineering Statistics, 2017). Conspicuously absent from these reports is explicit discussion of the historic exclusion and suppression of Black students in engineering fields, and higher education in general, that stimulated continuous underrepresentation (Denson et al., 2010; Riley, 2003; Slaton, 2010). Specifically, Black males have been largely absent from those achieving successful engineering degree matriculation. Between the years 2006 and 2016, Black males received only 3% of the bachelor's degrees awarded in engineering, which is correlated with the undergraduate enrollment of Black males being just 3% during the same period (Yoder, 2016). Withal, equitable engineering education is concerned with the quality of experience students have and not just their statistical representation. There is a growing body of scholarship providing insight on how to support Black students in pre-college engineering learning experiences (Nazar et al., 2019; Vakil, 2014; Wilson-Lopez et al., 2016; Wright et al., 2018). This paper puts emphasis on examining teaching practices so that K-12 engineering teaching and learning interactions do not replicate the marginalization that Black male students experience in broader society.

There are a host of asset-based instructional approaches that scholars have shared to transform the attitudes, beliefs, and practices of educators when teaching Black males; central to many of these approaches is the willingness to acknowledge and reinforce the students' cultural knowledge, skills, and attributes (Goings et al., 2015; McDougal III, 2009; Milner IV, 2007). These approaches prioritize the humanity of Black male students by affirming the significance of their lived experiences and endemic forms of cultural expression. Educators must first identify their own cultural reference points, and then enhance their cultural competence to be able to notice and interpret alternative forms of learning and social interaction demonstrated by Black male students (Hammond, 2014). Celebrating the cultural knowledge Black male students bring to the classroom is antithetical to the ways they are traditionally taught, and it increases their cognitive familiarity which in turn improves their engagement and learning (Gay, 2002; Hale, 1981; Hilliard, 1992; McDougal III, 2009; O'Connor et al., 2007). Thus, the asset-based strategy implemented in this study used transactional strategies (Boykin & Noguera, 2011) to situate the lived experiences of middle school Black boys as assets that positively contribute to their ability to learn engineering (Coleman & Davis, 2020; Ortiz et al., 2019). This article serves as a report of my design and implementation of an engineering course that is sensitive to the racism Black males navigate and offers insights from this course to other engineering educators on how to better support and leverage the assets of Black boys through engineering education.

**Overview of Study and Pedagogical Goals**

This autoethnographic inquiry examined my instructional design of an engineering learning experience within a culturally relevant pedagogical framework and the experience of facilitating my instructional design with middle school Black boys. My approach builds on prior scholarship that reframes the minimal presence of Black males in collegiate study and professional practice as a consequence of problems within engineering instructional practice rather than within Black males (Davis, 2020; Dumas & Nelson, 2016; Harper & Davis III, 2012; Kunjufu, 1983). In this section I will briefly discuss the methodology and theories that informed my investigation of my own course design and facilitation; then I will focus on the pedagogical resolutions that constructed the organization of the learning experience. This study centered my own experience, so any data presented on student experiences are provided to offer insight into what informed my decision-making as I exercised reflexive instructional practice. I present my positionality as instructive to other pre-college engineering educators desiring to work through the sociopolitical issues of equity, power, and culture in the ways we teach. As an educator in pursuit of equitable pre-college engineering education, I sought to implement instructional practices that prioritize the assets of the students most disenfranchised by traditional teaching norms. As a researcher, I used a design-based research approach that included autoethnography as its particular methodology. Autoethnography layered with Black Critical Theory and African American Male Theory was used to investigate the research question: What strategies and activities did I develop and implement to teach engineering to Black male youth with explicit consideration of their sociopolitical context?

*Centering Culture in Pedagogical Practice*

Many scholars have presented models for teaching that reject the false dichotomy of excellence and cultural sensitivity, which include: (a) culturally appropriate (Au & Jordan, 1981); (b) culturally congruent (Mohatt & Erickson, 1981); (c) mitigating cultural discontinuity (Macias, 1987); (d) culturally responsive (Cazden & Leggett, 1981); (e) culturally compatible (Jordan, 1985); (f) culturally relevant (Ladson-Billings, 1995); and (g) culturally sustaining (Paris, 2012) pedagogy. All these educational theories have roots in cultural difference theory, which "attributes the academic difficulties of students from subordinated groups to cultural incongruence or discontinuities between the learning, language-use, and behavioral practices found in the home and those expected by the schools" (Bartolome, 1994, p. 183). Culturally relevant pedagogy (CRP) is the culmination of a body of research that explores and challenges the notion that Black youths are less educable than their White counterparts (Bang & Medin, 2010; Paris & Alim, 2014). Classroom achievement becomes a means for students to build the skills to critically engage in society and contribute positively to its improvement. Concurrently students develop self-confidence in their natal cultures and establish an appreciation for the cultures of people different from themselves. Each of the three pillars of CRP appears as a simple and feasible objective when sought individually, but when combined form a difficult, though practical, aspiration. Many teachers have struggled to first understand these principles completely, and then implement them appropriately in their classrooms. Accordingly, Ladson-Billings (2014) has a further explanation of the tenets of CRP:

> Briefly, by academic success I refer to the intellectual growth that students experience as a result of classroom instruction and learning experiences. Cultural competence refers to the ability to help students appreciate and celebrate their cultures of origin while gaining knowledge of and fluency in at least one other culture. Sociopolitical consciousness is the ability to take learning beyond the confines of the classroom using school knowledge and skills to identify, analyze, and solve real-world problems. (p. 75)

While admitting these are fundamental principles of good teaching practice, they are frequently absent in classrooms dominated by racially minoritized students, especially in science, technology, engineering, and mathematics (STEM) educational spaces (Braden, 2020; Davis & Martin, 2009; Sheth, 2019).

The impetus of this project was to admonish engineering educators to critically evaluate how culturally relevant teaching can be exerted in this field. CRP not only prepares students to solve problems that extend beyond the classroom, but also uses a context that is relevant to the students and builds opportunity for sociocultural liberation (Freire, 1974; Giroux, 1988; Gutstein et al., 1997; Ladson-Billings, 1992). More important than content-specific techniques is emphasizing the functionality of the material for students' out-of-class experiences; this means CRP is just as feasible for teaching engineering and the engineering habits of mind as it is for teaching science, math, and reading (Gutstein et al., 1997; Ladson-Billings, 1992; Leonard et al., 2009). Many students experience difficulty transferring principles of academic content from one context to another, though it is the very skill many teachers are trying to develop; therefore, this effort to cultivate higher-order thinking skills must be intentional and integrated with highly effective pedagogical practices.

This framework shaped the contextualization of engineering examples in my curriculum and motivated the inclusion of non-engineering topics like politics and civics, because one cannot genuinely educate Black males without considering our socialization within broader society (Ferguson, 2020; Holly Jr., 2020). The exclusion of Black males in engineering is a consequence of our exclusion from mainstream society; indeed, the degrading paradigms that construe our socioeconomic and cultural marginalization also construct the content and context of engineering (Nasir & Vakil, 2017). At the institutional level ideologies such as meritocracy and colorblindness, which place Black people in an inferior physical and social position (Bonilla-Silva, 2001), determine: who has access to engineering majors, what disciplinary knowledge is important, whose intellectual contributions are affirmed, and whose success is legitimate, among other features. The impediments to our access are simply the foundations to the infrastructure that prohibit our full inclusion in the engineering ecosystem (Burt et al., 2018; Carey, 2019; McGee, 2020b). Once we overcome the barrier of access so that we can participate in engineering learning spaces, we then must navigate the abhorrence displayed by those with whom we share our presence, ideas, and self-expression. Black males being present to learn engineering is not enough; educators would do well to develop a pedagogical disposition that dispels racist notions about our ability to learn engineering content, while reconceptualizing our epistemological contributions to engineering.

*Course Learning Outcomes*

I designed a relatively brief program for Black boys to serve as the educational and research context for this study. The program consisted of ten sessions, each for two hours, with a progression from general topics regarding education to the introduction and experience with the engineering design process (see Table 1). I initially gave the students a broad

Table 1
Session-by-session breakdown of program activities.

| Session number | Activities |
| --- | --- |
| 1 | I provided an overview of the program and repeated the research process, we did ice breakers to build a communal environment, then we discussed the boys' perspectives on the value of school and what is meant by the term "scholar." |
| 2 | We did some self-definition activities which helped them think about the meaning they give to their racial identity, and I facilitated a game that highlights diverse (e.g., college attainment, discipline) Black male engineers. |
| 3 | We discussed Figueiredo's (2008) four dimensions of engineering, along with the pathway to becoming an engineer (e.g., classes, extracurricular experiences) from high school through college. |
| 4 | We discussed about the boys' perspectives on their trust in governing officials and the effectiveness of governmental policy in addressing community and national problems. |
| 5 | I taught students about the engineering design process and engineering habits of mind (eHOM). |
| 6 | The boys were given an activity to demonstrate their understanding of the eHOM: they had to design a solution to a scenario I provided, and then they worked in groups to address an issue of shared interest. |
| 7 | I introduced an activity I created for students to communicate their understanding of the eHOM as defined in the context of engineering, then practice identifying how the six habits of mind can be enacted in non-engineering contexts. |
| 8 | The boys continued to work in groups to address the problem they identified in session 6. |
| 9 | We revisited the civics discussion and talked about ways to strategically translate ideas to action when addressing complex problems; this was an activity to assist students in thinking about social implications of various issues. |
| 10 | I provided a review of the concepts we discussed throughout the program, and then students gave presentations about their design projects to family and community members. |

definition of engineering using Wikipedia's description of engineers as "people who invent, design, analyze, build, and test machines, systems, structures and materials to fulfill objectives and requirements while considering the limitations of usefulness, guidelines, safety, and cost" ("Engineer," 2021) because I considered the language to be easily understandable for the students. Later in the course I discussed Figueiredo's (2008) four dimensions of engineering as a more detailed though accessible conception of engineering, which are basic sciences, social sciences, design, and practical realization. I found his framing of each domain useful in categorizing the multidimensionality of engineering. In the dimension of the basic sciences, engineering is viewed as the application of the natural and exact sciences. This dimension suggests engineering tends to emphasize the values of logic and rigor, and sees knowledge as produced through analysis and experimentation. This perspective provides two weighty claims: that science can be exact and that knowledge results from the scientific method. I contest the epistemic authority of the scientific method embedded in this dimension, but understanding and applying the basic sciences are vital aspects of engineering and are prioritized in the way engineering is taught (Hynes & Swenson, 2013; Pawley, 2009). The social sciences dimension sees engineers not just as technologists, but also as social experts in their ability to recognize the eminently social nature of the world they act upon and the social complexity of the teams they belong to (Figueiredo, 2008). This frame of reference implies engineers can interact with others within society and can accurately determine their needs. There is much evidence on how engineering has been historically deficient in this area (Riley, 2008); however, scholarship and reports are advocating for an improved effort to develop and demonstrate these social skills (Fila et al., 2014; National Academy of Engineering, 2004).

The design dimension sees engineering as the art of design. The overlap between engineering and design is apparent as Lawson and Dorst (2009) speak of design as a problem-solving process, which Koen (2003) describes as the engineering method. Practical realization, the final dimension, views engineering as the art of getting things done, valuing the ability to change the world, and overcoming complexity with flexibility and perseverance. It is in this dimension that the engineer has the capacity to affect the wellbeing of greater society. I suggest the intersection of the four-dimensional framework that Figueiredo presents is where emphasis should be, because it produces a holistic engineer capable of responsibly addressing issues in society. The importance of an engineer's ability to get things done should parallel their ability to appropriately access and engage the social nature of the world in which they work. It is my perspective that only when this occurs can we define engineering as improving the living experience for all of society.

Each lesson was organized to meet the following objectives: (1) to identify and promote connections between engineering and the daily lives of the students, (2) to encourage comfort with, and confidence in, students' racial and cultural identity, along with motivation to learn/explore other cultures, (3) to stimulate interest in communal issues and critical civic praxis, and (4) to inspire scholarly ambitions.

In a broad sense the purpose of the program was to build on any exposure to engineering the boys had experienced and provide a space for them to deepen their scholar and racial identities in community with one another. The research site was a recreational center located in the residential neighborhood of many of the boys that participated. This center contained a large multipurpose room for group activities and two smaller classrooms; one was used for games and evening meetings and

the other was the primary location for academic activities (e.g., after-school tutoring). There is a basketball court across from the recreational site and a playscape for young children. On most days many children would be playing inside and outside the center; usually one staff person was on site and many students appeared to enjoy interacting with the staff. This site was chosen due to the number of youths in proximal residence which would minimize transportation issues. I learned through my relationship with the staff of the site that many of the boys regularly attended the programming facilitated by the managers of the recreational center prior to this project.

*Theoretical Frameworks*

Engineering education researchers often use deficit-based approaches to examine issues regarding racial diversity and inclusion, even when employing critical theoretical frameworks designed to inform anti-deficit research processes (Mejia et al., 2018); whereas, in pre-college spaces explicit engagement with social inequity within engineering is either misunderstood or avoided for more palatable programming (Gillen et al., 2018). For example, deficit-based research suggests Black students lack adequate academic preparation or motivation to be admitted to or successful in engineering, focusing on perceived student deficiencies. Highlighting the assets these students possess would locate the problem within the circumstances the students have navigated, which would allow for better analysis of the symptoms the students demonstrate stemming from larger structural issues beyond their control. Therefore, we must be thoughtful about our research practices from inception to completion. Black critical theory, or BlackCrit, was advantageous for this project because it provides specificity to the ways Black people are subjugated in American society. BlackCrit surpasses theorizing racism, simply acknowledging the oppression of White supremacy, to delineate a theory of Blackness (Dumas & ross, 2016) and the richness of Black epistemology, ontology, and axiology. As race is socially constructed and yet has tangible dis/advantages, Blackness inevitably complicates the identities and experiences of Black people as we attempt to navigate our current reality while trying to rebuild a more liberative existence. As a Black man, I can attest to the dissimilar ways in which Blackness is understood, experienced, and expressed across gendered notions of identity. Thus, it follows that an additional theoretical framework able to ruminate racism and its peculiar conjunction with gender dynamics is crucial for this project.

Bush and Bush (2013) introduce African American male theory (AAMT), which they describe as a theoretical framework that vocalizes "the position and trajectory of African American boys and men in society by drawing on and accounting for pre- and post-enslavement experiences while capturing their spiritual, psychological, social, and educational development and station" (p. 6). This framework builds on Bronfenbrenner's model of interconnected environmental systems to present an ecological systems approach to analyzing the experiences of Black males. The AAMT ecology includes the biological makeup of Black males individually, the major events during the Black male's lifetime that influence their development, and the indirect influences of their external environment, among other impacts. Yet, the aim of AAMT is not necessarily to respond to cultural hegemony and racism but rather to explicitly account for it as AAMT works to draw upon the historical and current culture, consciousness, and community to determine what is socially just for Black males (Bush & Bush, 2013). AAMT is complementary to BlackCrit as a robust framework that emphasizes the deleterious effects of the racialized and gendered attributes of anti-Black racism while promoting a liberatory future rooted in social justice (Figure 1).



**BlackCrit**
- Concerned primarily with Black people
- Centralizes anti-Blackness in society – places Blackness in conflict with neoliberal multiculturalism
- Accounts for post-enslavement experiences

**AAMT**
- Concerned primarily with Black males – considers intersection of race and gender
- Centralizes ecological approach to analyzing Black males
- Accounts for pre- and post-enslavement experiences

Asserts the normality of racism in America – suggests racism has had a profound and unique impact on Black Americans (i.e., anti-blackness)
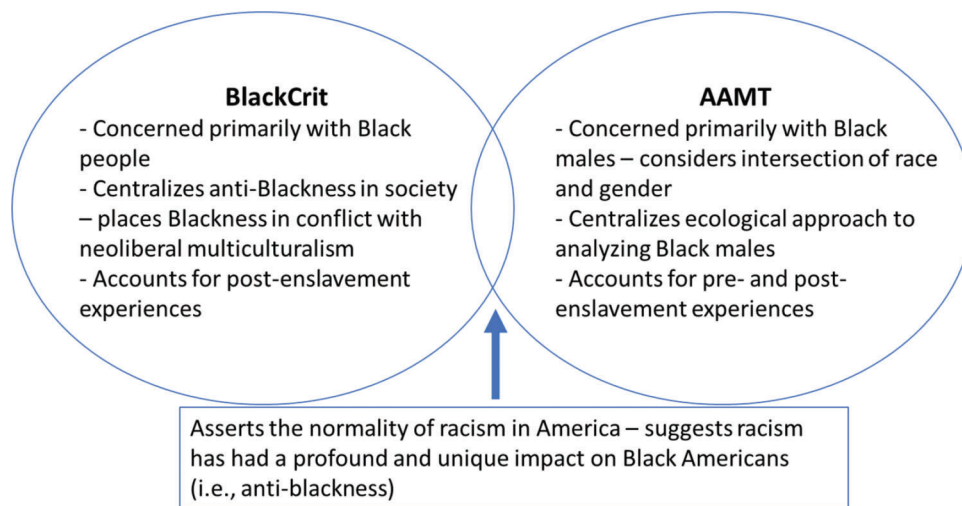
*Figure 1.* Relationship between Black critical theory and African American male theory.

Taken together, this combination of frameworks formulates a comprehensive lens to examine how identity and culture affect my teaching practice.

**Methods**

*Autobiographical Ethnography*

With roots in ethnography and bearing many similarities to narrative inquiry, self-study, and hermeneutics, autoethnography involves a systematic analysis of one's personal experiences within a particular culture, community, or context (Ellis et al., 2011; Patton, 2002; Reed-Danahay, 1997). Therefore, elements of autobiography are present but autoethnographic research aspires to do more than share one's personal narrative; rather, these very personal and critical anecdotes aspire to advance sociological understanding given some cultural context (Sparkes, 2000). Researchers that use autoethnography suggest that genuinely understanding one's self is a prerequisite for understanding others; with this project I suggest understanding of our own educational practice is a prerequisite to understanding a problem with the educational practice of the broader engineering community. Starr (2010) explains the value of situating ourselves in our work, stating, "the process of self-exploration and interrogation aids individuals in locating themselves within their own history and culture allowing them to broaden their understanding of their own values in relation to others" (p. 1). This investigation into one's point of view is a necessary analysis for educators desiring to counteract complex racial inequities, yet demands reflexivity of self and practice. Since racial/ethnic diversity and equity are core concerns to me as a Black man in America, I intentionally use my scholarly and professional pursuits as instruments for advocacy toward educational enfranchisement in the advancement of engineering literacy for pre-college students.

Autoethnography is also a dissent from exploitative research practices, whereby members of academe would exercise "colonialist, sterile research impulses of authoritatively entering a culture, exploiting cultural members, and then recklessly leaving to write about the culture for monetary and/or professional gain, while disregarding relational ties to cultural members" (Ellis et al., 2011, p. 274). This common approach to conducting research often reifies and perpetuates domineering power dynamics within and beyond the research community (Hughes & Pennington, 2016). Autoethnographic chronicles challenge the epistemic authority of observational science and researcher objectivity to centralize the subjectivity, ideologies, and relational connectivity of the researcher (Ellis et al., 2011; Starr, 2010). The introspection articulated through autoethnography is not principally about the self, but a lens through which one seeks understanding of others' cultural positioning (Chang, 2008; Pfohl & Gordon, 1986; Starr, 2010). This self-study is a *critical* autoethnography because data were used to analyze power structures within the cultural practices of teaching engineering when I examined my own story (Merriam & Tisdell, 2015).

*Data Collection*

The students discussed in this project are considered secondary participants because they were involved in the course I designed; however, the study is mainly about me as the primary research subject, specifically my course design decisions and facilitation. The students were middle-school-aged (10–13 years) Black boys living in an urban emergent city (Milner IV, 2012) and they were recruited using convenience sampling (Patton, 2002). I distributed flyers with information about the study to youth at the research site and to youth that attended an after-school tutoring program I facilitated at a different location. I asked students who showed interest in participating in the course to introduce me to their parents, after which I discussed the details of the study and presented the institutional review board (IRB) approved documents for their parents to sign. If the boys met the age and race requirement, multiracial boys were welcomed to participate based on their own self-identification as Black, and after their IRB documents were completed they were allowed to participate in the course. Altogether at least 15 different Black boys attended the program once or more.

The data collection methods in autoethnographic research mirror those of general qualitative research (e.g., journaling, videotaping, interviewing). I participated in interviews, wrote journal entries, and reviewed course video recordings to answer the research question: What strategies and activities did I develop and implement to teach engineering to Black male youth with explicit consideration of their sociopolitical context? Interviews are useful for learning directly from the source what is unobservable, gaining access into one's perspective (Patton, 2002); therefore, I was interviewed by a scholar with expertise in critical race theory before, during, and after the course. Each interview followed a semi-structured approach (Bernard, 2000; Cohen et al., 2011; Patton, 2002). These interviews provided an opportunity for someone outside my own outlook to ask questions about my thinking processes to clarify my curricular design and teaching approach. I also wrote journal entries before and after each meeting with the boys to record my intentions for the session, fidelity of facilitation, and any reflexive ponderings concerning my interaction with the boys. The journal entries allowed me to process my own

thoughts about my curricular design and teaching approach. When I wrote reflectively I concentrated on recounting various events, and when I wrote reflexively I focused on relaying my attitude and feelings regarding the various occurrences and my perceived effect on the learning experience.

I also video-recorded each course meeting to capture each moment of the course and used these data to review and reflect on specific events within the course. The video recorder was placed in the rear of the learning space since all students agreed to be video-recorded; I wore a microphone to capture any dialogue with students. I reviewed these recordings regularly throughout the course to examine if any adjustments needed to be made to increase students' participation or strengthen instructional facilitation. Artifacts students created to complete class tasks were occasionally created as formative assessments of student understanding, but all were ultimately returned to the students for their own appreciation and to share with their family and community. This data collection process resulted in over three hours of interview recordings, 25 journal entries, and more than 17 hours of video recordings to identify my pedagogical practice.

*Data Analysis*

The interviews were transcribed and coded, along with the journal entries, by identifying reoccurring themes that collectively produced a narrative that captured and cohesively elucidated my metacognitive approach to teaching Black boys engineering as a Black man (Ellis et al., 2011; Hughes & Pennington, 2016). I read every journal entry and listened to the interviews multiple times, taking note of the statements I read and heard that I believed were significant and resonated with me. I reviewed these statements and then began to form themes within each individual data source (i.e., each interview and journal entry). In reviewing the journal entries, I was mindful of BlackCrit as I searched for statements that demonstrated attempts to make sense of the social, economic, historical, and cultural implications of the experiences the boys shared, and those that I recalled from my life. For example, one entry stood out as I reflected on comments from one of the boys about the role of Black male influences. His comments on the absence of Black male teachers in his educational experience prompted me to reflect on scholarship that discusses the low presence of Black male teachers and the influence Black male teachers have on Black male students. When I analyzed my lesson plans, I considered examples in my instructional design of using engineering design and engineering thinking exercises to help the boys develop solutions to structural inequalities. I used open coding, sometimes referred to as initial coding (Charmaz, 2014; Corbin & Strauss, 2015), to develop a series of labels for portions of data that were then themed (DeSantis & Ugarriza, 2000). Each theme consisted of a short phrase that represented a broader meaning articulated by the data within the category. My thematic analysis can be considered highly interpretive as my personal experience in concert with my chosen theoretical frameworks converged to make meaning out of the designated themes across the video recordings, journal entries, and interviews. As I cross-referenced the most resonant themes across each data form, I composed my account of teaching engineering to Black boys as a Black man.

Codes for the interview transcripts and journal entries were assigned to units of text, and a unit consisted of one or more sentences usually not longer than one paragraph. The codes from each individual data source were compared and grouped to form hierarchal topics for the overall data, and five categories emerged from the analysis that are relevant to the research question discussed in this paper: self-awareness, counter-normative teaching, community engagement, racial and scholar identity, and sociotransformative engineering. Some of the identified codes were *racial pride and confidence*, *education beyond schooling*, and *collective racial esteem*; each of these were placed into the category of racial and scholar identity. Sociotransformative engineering included codes such as *transcontextual habits of mind*, *community problem-solving*, and *process as product*. The categories of self-awareness and racial and scholar identity were combined to form the theme of exhibiting political clarity in curriculum design and implementation. The categories of counter-normative teaching and sociotransformative engineering were combined into the theme of using students' lived experiences as authentic contexts for teaching engineering. As a result, three themes were identified during the data reduction process (Merriam, 2009; Miles & Huberman, 1994): (i) political clarity, (ii) authentic contexts, and (iii) know the students we teach.

*Quality Control*

There is much variance in perspectives on the criteria that ensure quality and rigor in autoethnographic research; the criteria put forth by Guba and Lincoln (1989), and later extended by Starr (2010), appear helpful to contextualize autoethnography within present standards that qualitative researchers are familiar with (Hughes & Pennington, 2016). The revised list of "authenticity, methodological, and rigor criteria" includes fairness, ontological authenticity, educative authenticity, catalytic authenticity, tactical authenticity, methodological rigor, and aesthetic rigor (Hughes & Pennington, 2016, p. 95). These criteria are not firmly specific to allow flexibility for the researcher to satisfy each criterion in a manner that is appropriate for their study; nevertheless, they impose on the researcher intentionality in the design of the project and accountability to the reader and research community for the way new understandings are presented.

These standards guided the narrative I constructed to relay the aspects of my personal experience that informed my instructional design, the interactions that took place during the project, and the takeaways I present as a result of this work. I aimed to assure *fairness* by acknowledging my own subjectivity as a Black man in interpreting the data and formulating the meaning of the evidence. I declared my perspective of how Black males are educated within a dehumanizing paradigm, and the crucial intentionality necessary to counter this trend. I sought *catalytic and educative authenticity* by using evocative storytelling to deconstruct prominent justifications for the minoritization of Black males in engineering. I attempted to write in a way that stimulates renewed educational dispositions; hopefully engineering educators will feel inspired to address and counteract this issue.

Nonetheless, I relied on triangulation of the data and ongoing introspection to communicate the contributions of this research to the field of engineering education, in alignment with methodological rigor. Withal, readers can still evaluate the reliability of my conclusions based on the evidence I present and determine the value of my discoveries for their own practice.

## Findings

The findings below include both my empirical data (i.e., journal entries, interview excerpts) and descriptions of the ideas that informed my thinking and pedagogy when conducting the course. This section is framed around three pedagogical principles, presented as themes, that came out of my analysis.

*Theme 1—Political Clarity: Exhibiting Political Clarity in Curriculum Design and Implementation*

The first theme was resonant within my journal entries and interviews where I shared my perspectives on the social and political position of Black people in America. After three-and-a-half years of ruminating over how I could impact the educational experiences of Black males within and beyond engineering, I devised a multidisciplinary approach to teaching engineering. I repelled the notion that the underrepresentation of Black American males in engineering is due to their incompetence, lack of resilience, or disinterest, so I determined that I would investigate a way to connect the repudiation of Black males in engineering with the larger anti-Black sentiment of America. Alternatively, I asserted Black Americans have a distinct epistemological and ontological existence that is in part due to the work of disproving the myth of Black inferiority. This myth is rooted in the development of the chattel slavery infrastructure and prevails to this very moment. Despite demonstrated excellence, the intellectual contributions of Black theologians, doctors, inventors, historians, etc., are devalued and often go unrecognized. I described this conceptualization in my first journal entry, prior to starting the research project:

> When I began determining how I wanted this course/project to be, my priority was making sure it was obvious that it is for Black boys. Not just in the content and structure of the course, but in the course title I wanted it to be known who the course is for. Honestly, I would have enjoyed including Black girls, but focusing on Black boys (who are characterized as performing the worst in school and life in the literature and media) allowed me to investigate deeper and more specifically. I did not necessarily set out to debunk myths or clarify misconceptions, rather, I was seeking to build-up Black boys, expose and encourage them, plant seeds of knowledge. My desire was/is not to change them, but to enrich them.
> Of course, throughout the course design process, I realized I cannot reasonably do all that I want to do. At that point I began to hone-in on what I can teach the students given the duration of the course. I settled on trying to help them develop some consciousness and self-definition of their racial identity…Given the prevalence of the colorblindness ideology, the students I planned to teach may not feel comfortable publicly discussing race/racism or may not know how. I want to explore where these boys are in that area, then encourage a positive sense of their racial identity because society will overwhelmingly encourage a negative perspective. [My teacher/researcher journal, 4/21/18]

When I examined my first journal entry, I was reminded of the research problem I aimed to address with this work, i.e., the absence of sociopolitical teaching practices in pre-college engineering education, which I contend are necessary for equitable inclusion of Black males. I believed there is a need to address the specific racial and gender needs of Black boys, beyond engineering, and this needed to be explicit. I held a particular position on the exclusivity of this course, but it was based on being able to engage the unique consequences faced by a particular group. I also felt comfortable creating a potentially uncomfortable classroom space because I believed the benefits of discussing hard topics, with tact and rooted in affirmation, far outweighed the harm done by leaving such ubiquitous circumstances unaddressed. I called this sociopolitical teaching and in my final interview I was asked to describe this phrase:

Interviewer: When you hear the words sociopolitical teaching, what does that mean to you?

Me: Uhhh, what I think of is just in a society someone's identity based on who they are, Black male/female…uhh, or whoever…how do they think about themselves, and then how does society interact with them individually, as well as with their peers communally. How has [others throughout] history treated [people like them]. It's having an understanding of that, and then providing information to that group of people or that person in a way that is sensitive to that broader dynamic. [Interview transcript, 5/30/18]

I considered sociopolitical teaching as necessary in engineering, and in education in general, because myths about the inferior intelligence of Black males remain present in the teaching practices and classroom norms of engineering educators. Also, I had read a lot of literature suggesting pre-college engineering programs focus on building Black male youth's engineering identity. This work considers how students think of themselves, which I state in the interview excerpt as important. However, I also mention the need for consideration of how society interacts with Black males based on their identity, and I perceived this as severely lacking in engineering education at every level, so it was central to my pedagogical approach.

During the course, discussions on race with some of the boys suggested more conversation and explanation was needed to help them develop a mature understanding of racism and its implications. Any child needs a healthy sense of self, but this need is magnified for Black boys because they exist in a nation that manufactures an abundance of messaging implying they are inferior and defective, predisposed to destructive behavior, and deserving of captivity and/or extinction (Alexander, 2010; Douglas, 2015; Kunjufu, 1983). I believed it was my responsibility as a Black man to offer messages of affirmation to the boys and some political education, whether or not they received such encouragement at home or anywhere else. This decision to emphasize civic awareness was significant given the ways traditional engineering instruction is presented in an apolitical manner:

The systems in which [Black boys] exist need change, and then their greatest potential would be more accessible… I wanted to introduce tools to help them navigate current systems (e.g., school, law enforcement) successfully. Success meaning staying alive (though out of their control), avoid or reducing self-defeating behavior, establishing healthy self-identity (racial and masculine), developing political awareness, working toward justice, understanding communal responsibility, and so many other things. [My teacher/researcher journal, 4/21/18]

I centered my understanding of the disparities in civic knowledge, dispositions, and opportunities between Black youth and their White peers (notably wide when considering the sub/urban divide). I had read many studies that demonstrated the overwhelmingly positive effects to Black youth's racial esteem and self-efficacy when they are supported in their sociopolitical development, helping them see that unjust power structures dictate opportunity in our society and these systems operate along illegitimate conceptions of race, gender, ability, and other identity markers. My modest interest grew into a feeling of responsibility to embed education on civic identity development and civic engagement into my teaching experiences with Black male youth. I thought it essential for the boys to discuss their perspective of power structures in our society and explore their civic identity.

*Theme 2—Authentic Contexts: Using Students' Lived Experiences for Teaching Engineering*

The second theme is about allowing students to bring their everyday experiences into the learning setting and using these scenarios as foundations for discussing engineering content and engaging in problem-solving exercises. This perspective informed the development of the course modules, so it was prevalent in my journal entries where I discussed my lesson plans before each session, and when I reflected on the fidelity of my instruction after each session. Also, this theme was prominent because the students worked on a design project throughout this course that I constructed to give them practice using engineering to address a social injustice issue. Before presenting the project, I introduced the engineering habits of mind (eHOM) which are values, attitudes, and cognitive skills that can be exercised in any context in one's life. The components of eHOM are systems thinking, creativity, optimism, collaboration, communication, and attention to ethical standards. For my work I consider these fundamental features of engineering thinking as they are promoted by the leading professional bodies within the discipline (National Academy of Engineering & National Research Council, 2009). I felt that one challenge of being a pre-college engineering educator is elucidating the aspects of the field that satisfy the paradox of being broad enough that it is relevant to any student, while also specific enough for its content to be measured and assessed. This instructional practice is summarized in this journal excerpt:

When discussing Systems Thinking I asked the students for examples after explaining the term, they gave technological systems, then I asked them for social systems since that is where I want to lead them. They were able to provide examples for both tech and social domains, demonstrating they had a decent understanding of the concept. After talking about examples, I wanted to offer students further practice, so I showed them a table that listed the habits of mind in one column, what each meant, and then how they could be demonstrated in a non-technical domain like Biking. Next, I told them to make a similar table, but they will determine the non-technical area. This entire table-making procedure is to help students with transfer, to be able to use their learning in terms of engineering in a non-engineering context. [My teacher/researcher journal, 5/14/18]

This journal entry describes an activity I created using students' residential community and intrinsic interests as problem-solving contexts by correlating the eHOM with one of their hobbies and civic engagement. I mention this knowledge transfer exercise to assist relatability of the content and deepen the boys' understanding (Gick & Holyoak, 1987), further displayed in Table 2. This excerpt and this example demonstrate my attempts to explicitly connect social and technical aspects of engineering in a relevant way. During the class, students used their chart to discuss how the concepts of systems thinking and communication can be used to address problems like homelessness, gang violence, and police brutality as I wrote in my journal:

Table 2
Abbreviated engineering thinking across diverse contexts chart.

| eHOM | Engineering | Basketball | Civic engagement | Ginwright (2011) |
|---|---|---|---|---|
| Systems thinking | Seeing interconnections, predicting outcomes | Dribbling, passing, shooting, defense, thinking (strategy) | • Define the problem <br> • Explore disjuncture | Healing |
| Optimism | Maintaining hope, persevering through failure(s) | Turnovers, missed shots/assignments, fatigue, bad/losing games | • Readily available good <br> • Embracing imagination <br> • Empowerment | Hope |
| Creativity | Using imagination for novel solutions | Crossovers, slam dunks, offensive/defensive schemes | | |

I gave the boys a few minutes to think of at least three community problems. As they told me the issues they selected, the list compiled included the following: racist police officers, gun shooting, fighting, littering, drugs, gangs, lack of diverse governmental representatives, and school miseducation. Some of these issues were identified individually by multiple students, with racist police officers being the most identified, perhaps this is due to the abundant cases propagated throughout mainstream media of police brutality and murder of Black males, and Black women. Moreover, these are very violent and traumatic issues to have to deal with on a regular basis, especially as youth. I think it has become so prevalent that these toxic circumstances are normalized, and Black boys are expected to cope and still be successful in their social, emotional, and intellectual development. This is a major problem. I then had the students work in their groups to specify a particular aspect of their topic to focus on, and then use the engineering habits of mind to articulate the components involved to building a problem-solving policy. [My teacher/researcher journal, 5/23/18]

This quote reveals the social realities these students navigated on a regular basis. The seriousness of the issues they named necessitates sensitivity and awareness on the part of the instructor to be a supportive resource. By allowing students to name the problems they would seek to address, I learned what they identified as important, but this pursuit of relevant contexts is also risky. The students were divided into two groups to complete the activity described in the journal entry. The information in Table 3 is what I transcribed from the video recording of this class session.

The student responses display what was prominent on their minds during the summer of 2018, which was filled with national outrage following the extrajudicial killings of Stephon Clark, Antwon Rose, and Emantic Bradford, Jr. among many others. As a Black man I was very aware of these events and deeply affected with feelings of fear, anguish, and powerlessness; though my desire to teach in a culturally relevant manner caused me to use the classroom context as a space for students to process their reactions. From a teaching perspective, I used this activity to serve as a formative assessment of the students' understanding of eHOM within a relevant social context; however, from a race-conscious perspective I discussed the limitations of engineering to address many of the issues the students named. My collegiate engineering instruction was depoliticized and colorblind, and there was never space to have difficult conversations about how

Table 3
Using eHOM to solve community problems—transcribed class activity (5/23/18).

| eHOM | Community problem: police brutality |
| --- | --- |
| Systems thinking | [White] racist cops think they are superior to Black males |
| Communication | If they pull a Black person over on the street, they don't care they have to sit still, all they care about is getting them off the street for no reason |
| Collaboration | No answer |
| Creativity | Diversify the police department |
| Optimism | If you are discriminated by a cop, like one of us Black males, you can't generalize every cop to be racist |
| Ethics | Give reasonable punishment for the cops that you catch that are racist towards Black males |

engineering related to my life outside the classroom. While these findings show precariousness of connecting classroom content with life experiences in an open-ended manner, it is also important to note the potential for engineering instruction to be socially transformative if done well.

*Theme 3—Knowing the Students We Teach: Building Relationships with Students, Their Families, and Community*

The final theme discussed here was most notable in my reflections on the design of the course, my journal entries after each class session, and in my reflections and interview following completion of the course. Some of the students in the class I had known for about a year prior to offering this class, others I was able to grow familiar with through interactions at community events and spending time at the research site outside of the days and times for the course. As I began the recruitment of students for my class, I was mindful of the history of unethical and exploitative research performed on Black individuals and communities in America (Scharff et al., 2010); therefore, I anticipated some hesitancy from parents when I began recruiting students for my study. I did not anticipate the in-depth conversations I had with parents that went beyond explaining the details of the project. While I intended to talk about racial identity with the boys in my class, I was made aware that some of their parents either felt unprepared or were simply scared to discuss this same topic with their children, though they certainly agreed racism is prevalent in our nation. Through conversations with parents, I was provided insight into the complexities Black parents must navigate when trying to provide a safe and healthy environment for their children to develop, which can lead to social and cultural isolation. I journaled about two discussions I had with parents that reassured my belief in the importance of my project:

> One mother I spoke with about the class shared her thoughts that Black kids in this community need more Black teachers, and how one of the property managers of her residence is racist. She asked me how I planned to talk to kids about racism, and whether we should at all? I had previously listened to some of her children speak about incidents they experienced involving racial prejudice in the schools they attend, and I had once before encouraged her to share such instances with the schools' administration and hold them accountable, but…she (and other parents) lack any faith in the school's attitude and response to such issues. This is the context in which these boys (and all of us) live. [My teacher/researcher journal, 4/28/18]

I knew the mother I mentioned in this entry through her children's participation in a tutoring program I facilitated, and our conversation reassured me of the importance of personal interactions and trust-building with the parents of Black boys. The rapport I had with this mother translated into her trust for her son to be in the class and provided comfort for her to share racist incidents she experienced; moreover, she affirmed the positive influence of Black teachers. These dialogs with parents of the students provided background information on the students that served as points of connection and/or sensitized me to the circumstances the students were enduring, which were helpful for supporting the students' wellness beyond the classroom. Lastly, this excerpt is representative of other data points related to this theme as the mother gives a brief insight into the troubled relationships between Black parents and educational institutions. Though her children shared multiple incidents they identified as racially prejudiced, just like other boys in the class, she did not feel the school would do anything to resolve these issues, so they developed coping mechanisms.

In my approach to the course, I held the perspective that the more time educators spend relationship-building with students, the easier it becomes to identify ways to help the students develop a continuity between their learning in the academic setting and their learning outside of it. I was convinced that once we establish a human connection where learners trust us with sharing the difficulty of their lives, we can then cultivate an intellectual connection where learners trust us as they engage the difficulty of academic content. With the course I facilitated I tried to enact a classroom experience that

accentuated the Black male community instead of competition, meaning pupils were encouraged to use their diversified skillsets to complement and strengthen each other rather than seeking to establish and maintain advantages. One journal entry where I reflect on a conversation with a student demonstrates the effectiveness of this approach:

> He said the class is "dope," he's mostly the only Black kid in his classes so he likes being around other Black boys. His school is P-8, and yet it is essentially all-White. I asked him what specifically about talking with other Black boys is helpful, he responded it helps him to know himself more, it's different from talking to White kids at his school because they're not as open and direct in their communication, only a few people does he feel fully comfortable around. Boys in the class say what they want how they want, that makes him feel more comfortable. He specifically said, "I can be all of myself" in my class, that was surprising, encouraging and cool, but sad. [My teacher/researcher journal, 5/15/18]

This example depicts how cultural norms in learning spaces are important, which include the ways students can speak to instructors and each other. The linguistic freedom of our classroom was a connection point for this student and allowed him to be present and engaged; furthermore, my familiarity and use of Black English (Baker-Bell, 2020) gave legitimacy and license for the students to communicate in this shared cultural language. My approach to helping the boys see one another as supports rather than competitors was critical for this student because he could come and be his full self, whereas in his school he had to simultaneously learn the content and learn how to engage with his peers in what he described as an inauthentic social context.

In my review of literature and personal experiences, I noticed many engineering lessons focus primarily on math and science; thus, I chose to deemphasize those areas to contextualize the other skills Black boys need to succeed in engineering. I talked about the attributes of the ideal engineer in a way that allows Black boys to see skills they already possess as useful in this career/discipline and promoted a multidimensional definition of engineering. I described this process of restoring emphasis on the social aspect of engineering by helping the boys think through how to use engineering thinking to address social problems. One example of this is an activity entitled "Make An Engineer," developed by Purdue's For All a Chance to Engineer research laboratory (FACElab); this exercise allows the boys to create their own engineering figurine based on their selection of hobbies, community problems, and critical thinking concepts. I described my rationale for using this activity:

> I believe this lesson is relevant and meaningful for the students because hopefully it will expand their conception of possible careers as a black male, they probably have not seen engineers in-person so the exposure at least plants an initial seed of who can be an engineer and the diverse ways they can work in the field. Also, it sets the context for which we will explore problem-solving and it can be empowering to see that they can engineer things themselves even if they don't want to be a professional engineer. [My teacher/researcher journal, 4/26/18]

I contemplated on how the low presence of Black males in engineering may cause Black boys to think they cannot be successful in engineering. This combination of activities allowed the boys to visualize themselves acting as engineers with their own cultural values, beliefs, and expressions, as opposed to thinking about what things they must set aside or expunge as a compromise to acculturate into the engineering community. I wanted these young males to feel empowered to enact social transformation and to pursue personal and professional advancement with social responsibility. My journal entries show that my approach for connecting engineering and civic engagement had much to do with my own dissatisfaction of engineers being characterized as problem-solvers in American society, but in actuality appear apathetic to the problems in Black communities. Having an awareness of some of the issues the boys were experiencing, I aspired to plant seeds for them to be problem-solvers for and with other people maneuvering the same struggles.

**Discussion**

This study shares my pedagogical approach for teaching engineering to a historically dehumanized population—Black male youth. My identification with this community and the sociohistorical context of the United States provide an intriguing circumstance for examining reflexive engineering teaching with the goal of providing an equitable learning experience. I used autoethnography to articulate the cultural and experiential knowledge that guided my instructional methods, and to suggest asset-based K-12 engineering education requires much more than good intentions. I employed a culturally relevant pedagogical approach to teach Black boys engineering design and habits of mind to help them navigate the obstacles of the educational space and society at large. Applying BlackCrit and AAMT as complementary frameworks allowed me to maximize the cultural capital these boys brought to the classroom to build academic capital.

The findings exhibit my approach to asset-based K-12 engineering education which involved having political clarity with one's self, using authentic problem-solving contexts, and engaging in relationship-building. While engineering literacy is an integral component in the pathway for pre-college youth interested in pursuing engineering careers, this asset-based approach to pre-college engineering education suggests the inclusion of previously excluded populations requires more nuanced understandings of students and their lived experiences to redress the culture of racism deeply entangled with the culture of engineering (McGee, 2020a). I was fortunate to matriculate through the educational system as a Black male studying engineering, and insights from my experience were useful to expand the conversation around low representation beyond deficit narratives (Mejia et al., 2018). Rather than emphasizing problems with students' resources and/or experience, my approach began with scrutinizing the larger system in which young Black male learners exist. Although my life experiences cannot be replicated, K-12 engineering educators can use this work as guidance for interrogating and articulating the ways in which their sociocultural paradigms inherently influence pedagogy.

*Implications for K-12 Engineering Education Pedagogy*

Engineering educators must consider how the cultural background of students coincide (or diverge) with the epistemological and ontological formation of an engineer. Black Americans are plagued by racial inequities that transcend all domains of societal living (e.g., economics, education, health, etc.); this lamentable reality is the direct result of historical disenfranchisement of this racial group within the United States. Therefore, engineering must be taught with pertinence to the social, political, and cultural realities of the pupils being engaged. For example, evaluating student grades and standardized test scores as predictors of success in engineering does not account for the economic, sociopolitical, and moral components of educational disparities that have created an educational debt owed to Black students. The pedagogical approaches that will enrich educational experiences of Black male students are beneficial to all students. Unfortunately, the learning spaces filled with Black students have lacked affirming instructional practices for decades and requires revolutionizing the ways Black males are taught engineering (Sims, 2018).

*Implications for K-12 Engineering Education Research*

Downey and Beddoes (2010) encouraged engineering educators to utilize "personal geographies" as a tool to explore their teaching in a global engineering context. Moreover, Streveler et al. (2007) have called for researchers in engineering to learn and implement the methods and paradigms of educational research, of which autoethnography is a part, to improve the rigor of engineering education research. The context that is used to study Black males needs to be broadened to include the successes and failures of Black males, within and outside of their educational experiences, as well as the external factors that contributed to their advancements or setbacks. Same-race elementary teachers have been shown to have a significant impact on reducing the high school dropout rates of Black boys (Gershenson et al., 2017), provoking intrigue to further investigate the impact of same-race and same-gender teachers on Black boys. Furthermore, researchers interested in studying asset-based K-12 engineering education should be mindful of the ways their theoretical frameworks and methodologies position Black males in the education and engineering ecosystem. Calabrese Barton (2001) and Mutegi (2011) suggest that for transformation to occur our scholarship must reckon with the sociohistorical realities of Black males' resilience to oppressive educational conditions; otherwise, we will only ensure the ongoing exclusion and devaluing of Black males in engineering.

**Conclusion**

Engineering education has an expanded presence in the pre-college schooling domain and unless intentional steps are taken to redress and resist racist educational practices, K-12 engineering educators will absorb and perpetuate the same prejudicial anti-Black traditions already severely detrimental to Black boys (Givens & Nasir, 2018; Kunjufu, 1983; Sims, 2018). I argue sociopolitical teaching in engineering, which can take many forms, appears apt to upend decontextualized and disparaging teaching practices for humanizing instruction that considers the symbolic violence and educational debt many Black males navigate daily (Hynes & Swenson, 2013; Madkins & McKinney de Royston, 2019; Mejia et al., 2020). Engineering educators that desire to engage in this practice must contend with the historic framing of social and technical aspects of engineering as distinct, with non-technical elements viewed as secondary (Cech, 2014; McGee, 2020a; Mosyjowski, 2020). Also, I encourage engineering educators to develop an adequate understanding of how to employ asset-oriented instructional practices with Black males, who are criminalized within and outside the classroom (Howard, 2013). Teaching engineering is not just about teaching engineering. Engineering educators must be aware of the ways the technocentricity of engineering (Riley, 2008), its proclamations of objectivity and depoliticization (Cech & Sherick, 2015),

and use of math and science as gatekeeping subject matter (Sheppard, 2011) disenfranchise Black students. In a racialized society we must take seriously the consequences of racial injustice; the materials we use and the atmosphere we provide should be affirming spaces where students can be comfortable in the classroom and learn to better navigate the environment outside the classroom. Through this experience I have grown in my awareness of myself, my raciogender community, and how to transfer research to practice. I suggest it would profit all educators to employ some form of autoethnographic reflection, because evaluating the aspects of my life that shaped me and analyzing my cultural paradigm was helpful in thinking of the ways the boys and I were similar and different. Even when educators desire to exercise liberative pedagogy, our selection of methods and materials is the result of our subjectivity in determining the most effective way to foster free thinking; therefore, we must do so with consideration of the deplorable normalcy of racism in America.

## Author Note

The term "Black" throughout this project, when referring to persons, is used to identify descendants of enslaved Africans brought to America via the Transatlantic slave trade.

## Author Bio

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